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UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

REGION 8

HUGH G. CALKINS

REGIONAL CONSERVATOR

THE FORESTRY PHASE OF FARM AND RANCH PLANNING

A HANDBOOK

FOR FORESTERS, FARM AND RANCH PLANNERS

Soil Conservation Service
U. S. Department of Agriculture

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THE FORESTRY PHASE OF FARM AND RANCH PLANNING

A HANDBOOK

FOR FORESTERS, FARM AND RANCH PLANNERS

Prepared by members of the Forestry Division, with the assistance of members of the Biology Division.

Issued at Albuquerque, New Mexico for the administrative use of Soil Conservation Service personnel.

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Forestry in Farm and Ranch Economy and Organization

Each farm or ranch presents a separate problem. Analysis of land capabilities, the economics of the holding (e.g. the need for wood products and/or income to be obtained from woodland* areas), the available labor which can be applied to the woodland enterprise and the physical necessities of erosion control cover, should all receive consideration in determining farm organization. This should lead to decisions as to the retention and management of existing woodlands and the increase or decrease in acreage through planting or clearing.

Where slope, soils, and moisture are satisfactory for cultivated crops there can usually be but little question that use as crop land will give greater returns than can be expected from the production of woodland products. On most woodland areas dual use for grazing and woodland will give greater returns than either one of these uses alone. In other cases, as in portions of the natural ponderosa pine or bottomland mesquite areas where production of wood products constitutes the highest use, subordination or exclusion of grazing will result in greater returns through maintenance of satisfactory forest conditions.

It is the planner's responsibility to relate the present land condition and use with the needs of the landowner, and to arrive at a plan which will provide the largest sustained income consistent with continued use.

From a forestry standpoint, the planner should have a comprehensive understanding of the landowner's needs for forest products. Every reasonable effort should be made to encourage him to produce on his own land the products he needs commensurate with economic use of the land.

There will be instances where products grown in excess of the landowner's needs can be sold. Generally there is a local market for sawtimber, fuelwood, vigas, corral poles, fence posts, mine props and ties. In the event that no market exists for all or any one of the products produced, the possibility of market development should be explored so that the landowner can realize the fullest value from a producing woodland area. Annual or periodic cash returns from woodland areas will do more than any thing else to promote care and management of forested lands.

Landowners can also be interested in the soil protective value of their farm woodlands. Although difficult to measure in terms of

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*Woodland - Any land dedicated to the growth of trees and associated vegetation not produced primarily for fruit or forage.

monetary return, the planner can point out the protection from flood and erosion, the protection of fields, crops and homesites from wind and frost action, and the other factors that are influenced or partially controlled by forested land.

Planting of Woody Vegetation

Introduction

The extensive planting of trees and shrubs in the Soil Conservation Service is limited in Region 8 by the adversity of conditions influencing establishment and growth. Even under irrigated conditions there is so much variation in soils, in alkalinity, length of growing season and in other factors influencing plant growth that unless trial plantings have been made it is often difficult to say what species are best to use. Opportunities for planting of woody trees and shrubs in situations where they have to depend upon the normal rainfall for growth and development are even more limited. In other words there are so many variations in climate, soil, and moisture conditions that plantings must be carefully planned to make sure that they will have the greatest opportunity for survival and consequently do an effective erosion control job.

The species information given in the table on page 18 will be found helpful but should be used only in conjunction with observational studies of native and introduced plantings in each locality. If the problem seems particularly difficult and available information does not indicate a solution, the services of a forester or someone having planting experience should be requested.

In planning for farms and ranches the planner should consider not only planting needs from the standpoint of soil and moisture conservation but he should also determine the needs of the cooperator for woodland products and opportunities for betterment of wildlife conditions. In other words what is needed is a complete planting plan for each individually owned unit to determine the full possibilities of meeting erosion control needs, wood products and improvement of wildlife conditions through the establishment of woody plantings.

It would be well for the planner to study past plantings of trees and shrubs in nearby towns and on farms and ranches to determine those which have through trial proven their worth under irrigated and dry-land conditions. When proposing plantings which will have to maintain themselves without irrigation, it is best, with but few exceptions, to use native species since these are most apt to survive. Some exotic* species have superior qualities from the standpoint of erosion control, production of wood products, or wildlife use and

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*Exotic - a plant not native to the locality.

where conditions are satisfactory they may be used. Favorable conditions may be found as sites normally moist the year round or sites that may be made favorable as by cultivation on the better dry farm lands or by supplying flood waters to plantings. Providing additional water is an especially important consideration as this practice will increase the growth rate and as well the life of the planting.

Exotics have been used in a number of field tests, and we have information on some exotics. Much yet remains to be done to develop the possibilities of their use throughout the region as a whole. From this standpoint field tests or trials are to be encouraged. However, such tests should be limited as to the number of trees used, not over 200 of each species in a given location, recommendations for such trials to be approved by a forester or a biologist. In instances where exotics have been tried and have proven successful they may be used in large scale planting operations. Such species will be discussed later with recommendations as to locations in which they are to be used.

A word of caution. Experience has demonstrated that it is not wise to plant in intermittent streams which are dry a large part of the year and without adequate underground moisture or, unless protected by mechanical means, in stream beds subject to heavy flows which may be expected to wash out the plantings. Under natural conditions moisture is a limiting factor which means that we will get results from plantings only on the better sites where sufficient moisture is available for plant establishment and development, and where damage from floods or from excessive grazing will not diminish the final results for which the planting was made. Existing vegetation in dry washes will give some indication of moisture conditions, but even where trees are present establishment of transplants may be very difficult due to dry critical periods before the small plants become established.

The intent of the preceding statements is not to discourage planting but rather to call attention to the many adverse conditions which should be recognized. Also, the planner should look for and recognize situations where effective plantings can be made.

Planning for Various Types of Planting

The major types of plantings in Region 8 are: (1) Forest, (2) woodlot, (3) windbreaks, (4) stream bottom protection, (5) gully control, and (6) miscellaneous types of plantings.

Forest Plantings

While main dependence is placed upon natural revegetation there will be some burns or retired fields that should be planted to timber species. Old burns usually are covered with brush, grass or weeds with

some bare spots. Even though erosion can be controlled through natural increase of the existing cover, planting is still desirable to make these lands as productive as possible. Rather than propose extensive plantings on burns it is best to first, establish a few test plantings to determine possibilities of artificial reforestation, before developing a large scale planting program. A forester should be consulted as to practicability of planting and the species to be used.

It is usually necessary to recommend exclusion of grazing for three or four years on replanted forest areas, after which time the areas must be properly grazed.

Woodlot Plantings

Woodlot plantings are made primarily to furnish posts, fuel and other products for farm use. When made on eroding lands, the SCS can furnish stock to the extent covered by present policy as noted later. However, there are many places in this region where woodlots are needed and the planting locations are not subject to erosion. This means that if the cooperator wants a woodlot he will have to procure planting stock by purchase or we can through technical assistance help him raise the planting stock he needs.

Recommended species: Hardy catalpa, thornless honey locust, osage orange, red mulberry, Russian olive, and black locust. Green ash provides excellent wood for wagon tongues, single and double trees, and farm timbers. Where these products are needed green ash should be included in woodlot plantings.

Spacing should be 6 x 8 and trees of one species should be planted in a single block so that in the woodlot there will be a pure stand or several blocks each composed of one species unless it is definitely known that species used are of equal tolerance and will each produce satisfactorily in mixture.

Woodlots should have shrub borders and where possible a row of shrubs should traverse the woodlot in one or more directions. For border plantings use fruit bearing shrubs such as squaw berry, western chokecherry, serviceberry, wild plum, pomegranate, and elderberry. The purpose of shrub border plantings is to prevent wind damage and excessive soil drying due to wind movement and to furnish food and cover for wildlife.

Provisions in the cooperative agreement should require such site preparation as plowing and leveling before planting and installation of necessary irrigation ditches, irrigation as necessary during the life of the planting, cultivation to keep out weeds until the tree crowns close and fencing for protection from grazing.

In some instances irrigation from flood waters may be practicable. If so, diversion structures will be necessary and provision must be made for placing the woodlot in condition so it can be watered.

Windbreak Plantings

Benefits to be derived from windbreaks:

1. Protection from wind and water erosion.
2. Aid in snow accumulation to provide more soil moisture.
3. Improvement of living conditions.
4. Protection for livestock on winter feeding grounds.
5. Provide usable wood products through judicious thinnings.
6. Increase the value of farm property.
7. Protect highways from drifting snow when plantings are properly positioned with reference to highway location.

Dryland Windbreaks

It is always desirable to point out to a landowner who intends to clear native woodland and break out additional farm land the advantages of leaving strips of vegetation on the contour and on the borders of the field. Strips can be left on the contour, to cover point rows, as well as at right angles to the direction of the prevailing winds. The size of holding or acreage to be cleared will obviously limit this practice.

Most of the opportunities for dry farm windbreak plantings in this region lie at elevations of 6000-7000 feet in Arizona, New Mexico and southwestern Colorado and at lower elevations in northern Utah.

With limited moisture conditions it is extremely important to have proper site preparation and continued maintenance of the windbreak plantings. Areas to be planted to windbreaks should be cultivated the previous summer so the site is in the same condition to receive trees as it would be to receive cultivated crops. This practice is necessary to preserve moisture through elimination of grass and weeds and to place the soil in condition to absorb the maximum amount of moisture. Listing and other protective practices will be necessary on areas subject to damage from wind and water during the period of clean cultivation.

Recommended species

Shrubs - Serviceberry, squawberry, chokecherry

Low trees - Russian olive, Chinese elm

Tall trees - Green ash

Evergreen - Ponderosa pine, Rocky Mountain red cedar

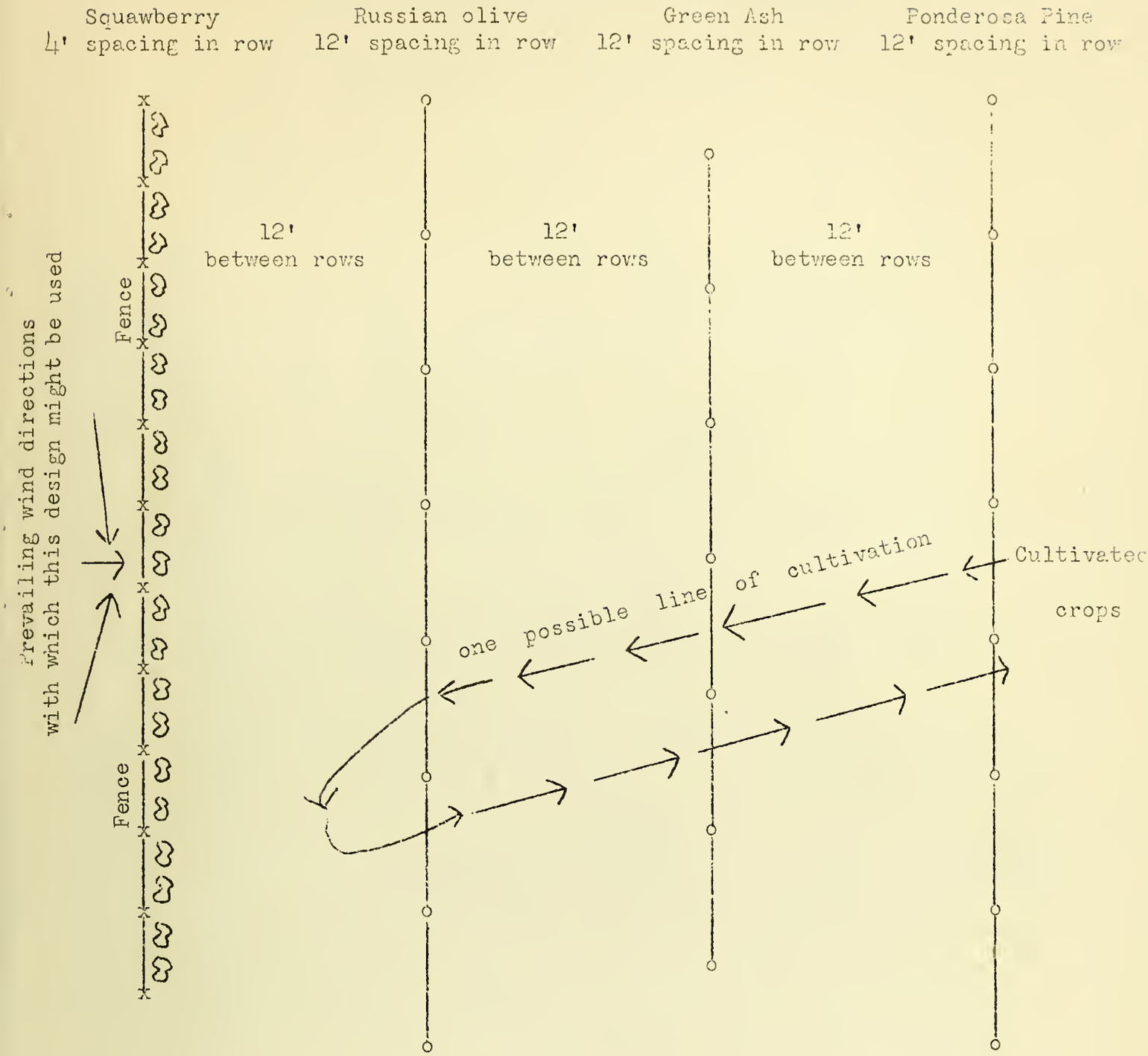
The outer or windward row should be of shrubs, the second row of low growing trees followed by tall trees and evergreens where evergreens can be used. Evergreens should always be planted on the leeward side where they will be protected by one or more rows of hardwoods. If a minimum of three rows are not possible on field borders, a low growing tree which retains its lower limbs should be selected for the windward row. This row together with a tall growing tree in the second row will give the best possible 2-row windbreak. Russian olive and green ash or Chinese elm are recommended where only two rows are used.

There are several possible windbreak designs or planting arrangements and the one to use in any given location depends on various factors such as slope and location of fields, wind direction, type of farming, type of equipment, and preference of the owner. The most efficient windbreak is one which will, using a minimum of ground, form a continuous barrier from the ground up to the tallest tree top without openings between trees.

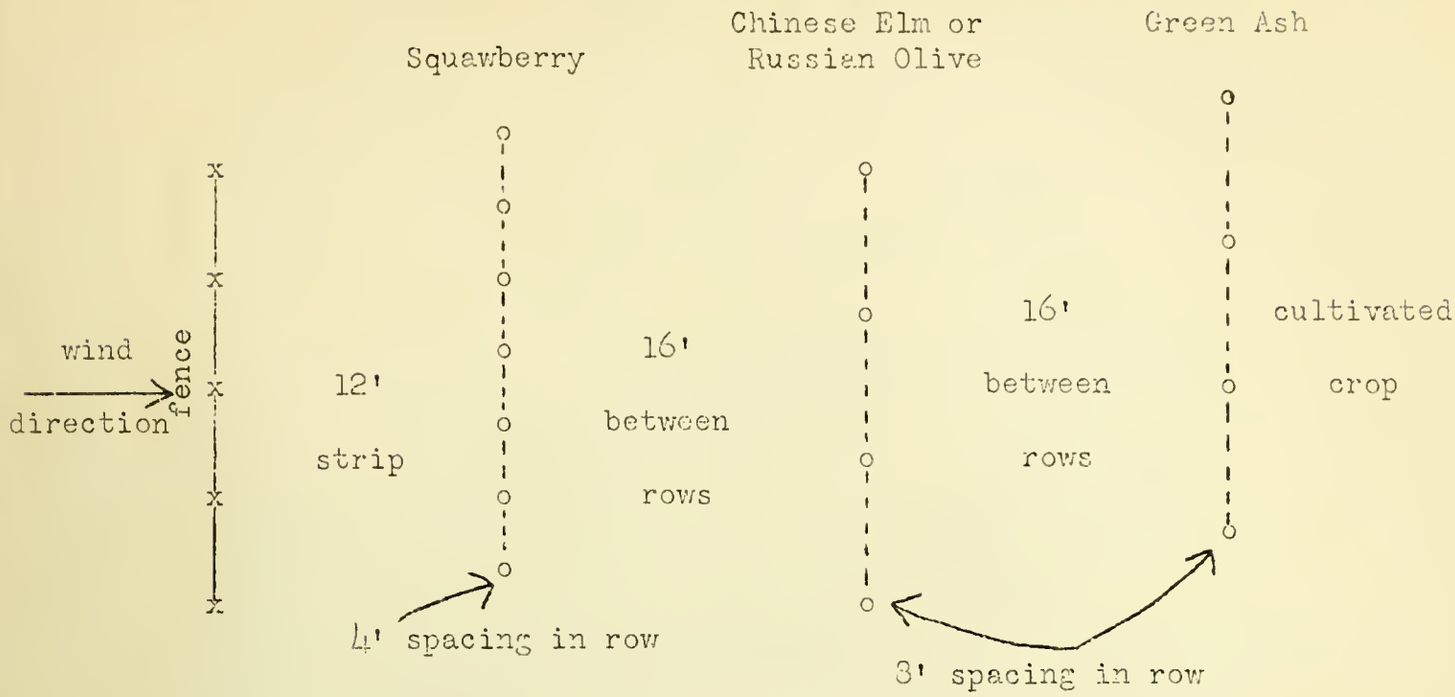
Where the area is relatively level the rows of trees can be placed parallel to the fence line and as nearly as possible at right angles to the prevailing wind direction. For the most efficient and quickest protection the spacing in the row should be not greater than 8 feet apart and staggered with respect to trees in adjacent rows on the windward side to close all openings. The outer or windward row should be of shrubs spaced 4 to 6 feet apart in the row. The second, third and subsequent rows should be spaced 8 feet apart in the row. Under dry land conditions spacing between rows should be not less than 14 feet where 8 foot spacing in the row is used, and it would be well to experiment with rows 16, 18 and 20 feet apart.

The above type of windbreak can only be cultivated in one direction. Where it is desired to cultivate in two directions or where farmers desire to go from the cropland through the windbreak and back into the cropland, spacing in the row can be increased to permit such practice. This spacing may insure better windbreak maintenance although the protection will not be as complete at first. Using this system where a cultivator is 10 feet wide would necessitate 12 x 12 spacing leaving an extra foot on each side to prevent injury to the trees. If damaging wind direction is directly parallel with the rows, this system should not be used. Where fence rows are not to be burned it would be possible to have a row of drought resistant shrubs such as squawberry against the fence and cultivated only on one side. Examples illustrating the two above types follow.

Example of 4 Row Dry Land Windbreak



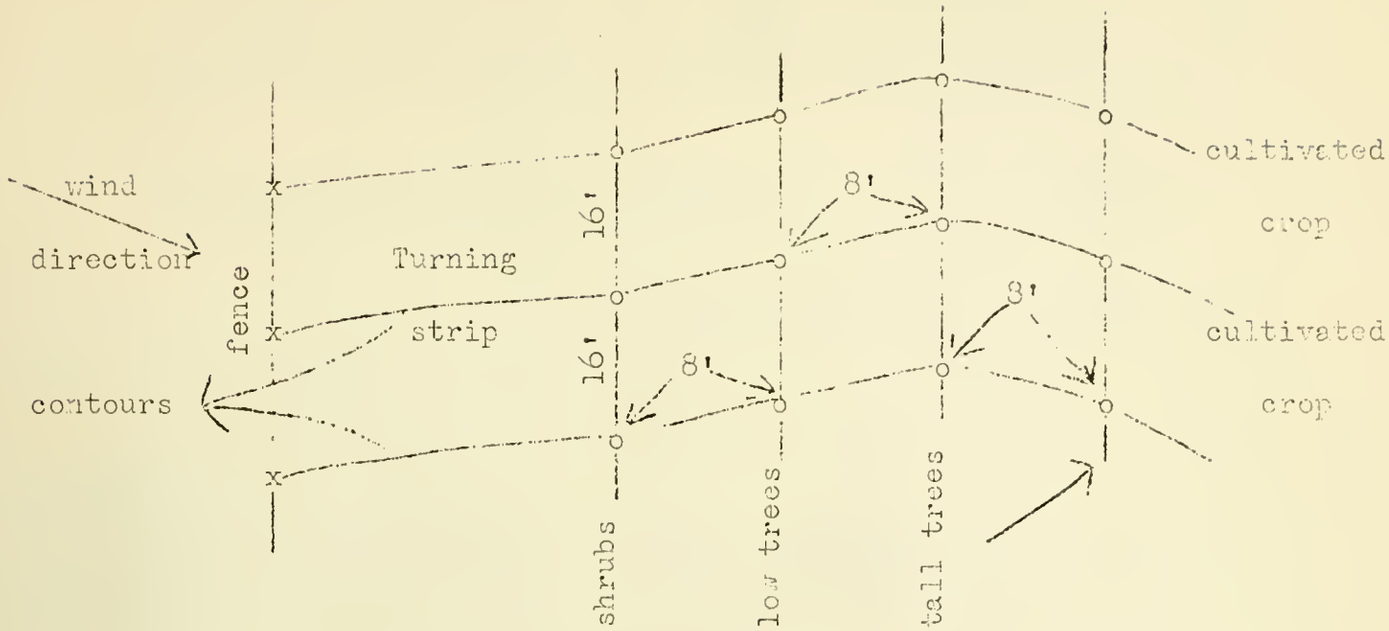
Example of a Three Row Dry Land Windbreak



Full knowledge should be had of the cooperator's equipment so that proposed spacing between rows and between the outer row and the fence will allow the most efficient use of equipment.

In rolling country, unless the cooperator owns or can obtain the use of a basin lister, it would be well to place plantings on the contour which would give a wide spacing of trees between contours and a narrow spacing of trees on the contour. Where row crops are to be grown the cooperator could cultivate on the contour from his row crop through the windbreak, turn his equipment on the turning strip adjoining the fence, come back through the windbreak and into his crop. Contour windbreak plantings may not be as effective as planting in rows parallel to the fence line and in some instances the rows may point into the direction from which damaging winds come. If this is the case contour windbreaks should not be proposed. In some instances windbreaks can be located slightly off contour in order to give the greatest possible protection. Windbreaks of this type should not be planted until the terraces have been established.

An Example of a Windbreak Planted on the Contour



It will be noticed that windbreaks planted on the contour take less space for a 4 row windbreak than does a three row windbreak of the type previously discussed.

Obviously there are other variations that can be used in windbreak design on dry farm land. A windbreak can, in rolling country, be located in the field where it will give the best protection providing it is designed so that machinery can be moved through it and thus cause no serious interference to crop cultivation. Cooperators might desire a two row planting above terraces where wind direction with reference to terrace locations will give protection to the entire area.

In some places single row plantings on the contour may be of value in holding snow. This method is now being tried out near Craig, Colorado.

Advantage can be taken of run-off from highways, drainage channels and fields to divert additional moisture to windbreaks. When this is done trees should be planted behind earth dikes and outlets should be so placed in each dike that watering will be automatic.

The advantages and disadvantages of windbreaks should be fully considered with relation to each unit and to adjoining holdings. In some places considerable damage may be done by windbreaks which cause deposition on farm lands of soil carried from outside areas. Plans therefore should be drawn up for groups of farms where soil blowing is taking place rather than for individual farms and cooperative work should progress from the windward to the leeward side of such areas. Effect of windbreaks on air drainage may be locally important. Con-

ditions of topography may clearly indicate that windbreaks paralleling field borders may be effective for so short a distance as to be of little value. Another point to be considered is whether the advantages of protection including prevention of soil loss resulting from windbreak establishment is of greater value than the loss of cropland.

The cooperative agreement applying to dry land windbreaks should contain the following provisions:

1. Site preparation. Thorough cultivation, the summer before planting, so the site is in the same condition to receive trees as it would be to receive cultivated crops.

2. Spacing requirements previously indicated and covered by the planting plan.

3. Clean cultivation of windbreaks to keep down competing vegetation.

4. Protection from grazing damage.

If the site is not in proper condition for planting, no planting should be done until it is in satisfactory shape.

Rather than develop extensive dry land windbreak plantings it is best to propose them only where one is sure the landowner will give them satisfactory care and where their establishment is fully justified.

Irrigated Windbreaks

For windbreaks on irrigated land the distance between rows should be 8 to 12 feet with spacing in the row of 6 to 8 feet.

For hardwoods, irrigation should be stopped the last of August to early October depending upon the location. This tends to harden new growth before the early frosts. After the leaves have fallen it is important to give a heavy irrigation to insure moisture for growth the following spring. Conifers should be watered until winter.

Good trees for windbreak planting on irrigated land are Russian olive, red mulberry, green ash, Western catalpa. Black and honey locust are good trees but if planted next to cultivated crops root injury due to soil working may cause sprouting. Osage orange may spread.

If single row windbreaks are desired, red mulberry is a good tree to use since it will if properly handled give good protection from wind and furnish posts as well. For narrow fields Russian olive is similarly valuable.

Where soil and climatic conditions are satisfactory fruit and nut bearing trees may be included in windbreak plantings.

Statements in agreements concerning irrigated windbreaks should cover:

1. Site preparation. Plowing, leveling and harrowing the summer before planting, installation of necessary irrigation ditches.

2. Cultivation for the first two years.

3. Irrigation as necessary during each growing season.

Stream Bank and Flood Plain Protection Plantings

This heading covers plantings designed to protect land adjacent to streams and rivers from lateral stream cutting. They are of great importance in several localities in Region 8 where streams of varying gradient are destroying large areas of valuable farm land by lateral cutting.

The first need is for overall river plans for given stream sections or "reaches" that can be logically planned between two control points. Structural work, primarily tree and cable revetment, is often necessary for protection of plantings on cutting curves. The overall plan should consider both structural and planting needs and the locations of structures and plantings should be indicated on an overall map.

This work is rather specialized and the planner, unless he is well acquainted with methods, should request the aid of a forester and an engineer.

Points to consider in planning are:

1. Do not develop plans for a single holding. Plans should cover designated "reaches" of the stream, each "reach" located between two control points.

2. Propose structural work only where it is needed e.g. on cutting curves.

3. Be sure the plan is complete so that flood waters cannot cause channels behind the structures and plantings.

4. Do not propose too narrow a channel. To do so will cause constriction and further bank cutting. Usually sections of any stream well stabilized on both banks can be found which give a good indication of the channel width necessary and which will tend to keep itself open.

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5. Where possible plan the planting locations so they allow adequate planting space, the wider the better.

Tree willows are best to use as edge plantings and also back against cut banks. They are better able to withstand direct stream action than are shrub willows where heavy flows are periodically expected. Baccharis has fast growing and spreading characteristics and shows considerable promise for bank protection planting where direct stream action is not excessive. Other tree species able to withstand silting may be used for desilting purposes back of the edge plantings. Russian olive is a good species to use for this purpose, other species should be planted on a test basis unless evidence is at hand to support larger plantings.

In the southern areas Dudley willow is the best tree willow to use while in the colder portions of the region use fragile or crack willow. Use cuttings from one or two year old stock or larger material where past use has shown successful results. When planting is proposed behind structures use long cuttings which will not be covered with silt or wait until silting has occurred and then plant. On page 14 is a diagram showing a sample stream bank protection plan.

In some locations, barrier-hedge plantings will constitute a logical part of the stream bank protection plan. They should be used in situations comparable to those along the Gila River where flood waters periodically cover portions of cultivated fields.

Barrier hedge plantings are designed primarily for farm areas adjacent to, or a part of, the normal flood plain. The purpose of these plantings is to check flood waters and thus cause silt deposition, to prevent the formation of new side channels, and to direct the flow of water back into the normal river channel. Barrier hedge plantings must be correlated directly with the farm and river protection program. Best results will be obtained if the barrier hedges are tied to natural or artificial river bank protection plantings and extended to a level sufficiently higher than the normal flood height. The diagram on page 14 shows some planting arrangements for stream bank protection plantings including barrier hedges. There will, of course, be variations in condition other than those shown but the scheme of handling to prevent bank cutting is of general application. The best location of a barrier hedge is at a lesser angle to the direction of stream flow than indicated by the diagram but the angle of planting will be largely governed by the field boundary fences. The distance between such plantings and their location will vary with the individual farms, intensity of flooding, area of flood plain, degree of slope, and other physical factors. Each barrier should be composed of one or two rows of plantings, preferably of a shrub species which will grow to a height of 10 or 12 feet. Species selected should not compete with farm crops and will normally have to be irrigated. Species recommended for the lower Gila are squawberry and pomegranate. For the Cliff-Gila section squawberry should be used.

Spacing on both stream bank and barrier hedge planting should be close enough to give early protection as time is an important factor in river control work. Tree willows having fast growing qualities may be planted six feet apart in the row with staggered spacing so that the second row will block the openings between trees of the first row. Shrub willow may be planted as close as 3 or 4 feet apart along the stream front where their use is advisable. Back of the stream edge planting spacing may be wider depending on moisture conditions and species used. Barrier plantings of shrubs should be planted on a 3 to 4 foot spacing depending on the shrub species used.

In most instances cuttings can be obtained locally and the agreement should state that the SCS can procure cuttings from the holding concerned for use on the cooperator's lands as well as on other holdings. Protection from livestock is essential. The cooperator should understand that the price of protection from bank cutting is continual vigilance to hold the ground gained by replanting where necessary to maintain a continuous vegetated strip on the stream bank. Replanting should be the cooperator's responsibility. The cooperator should be required to remove lodged debris from the open channel, as a maintenance measure. Inspection should be made frequently, especially after floods.

Gully Control Plantings

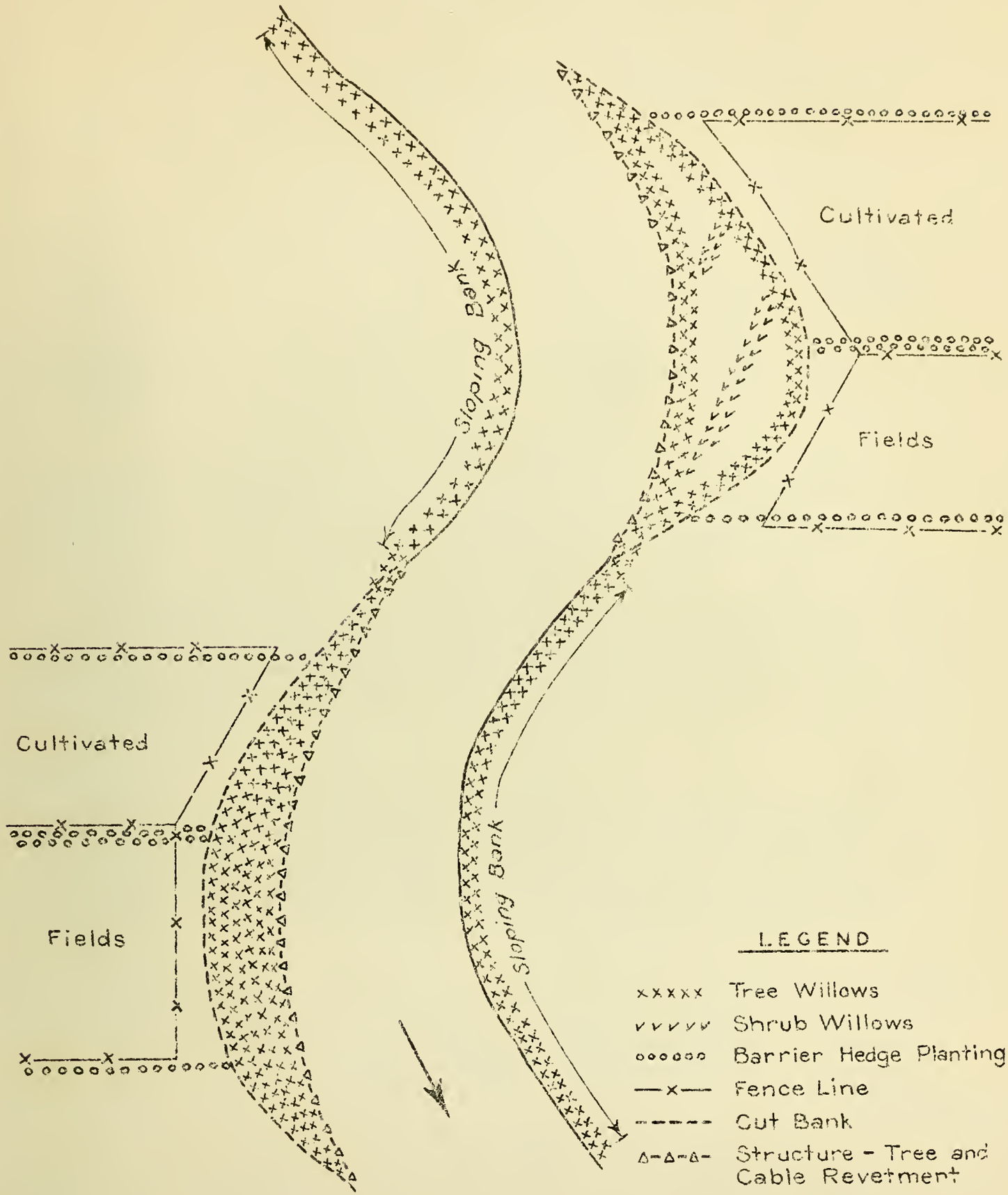
As noted previously gullies selected for planting should have sufficient moisture for plant establishment and growth and the plants should not be unduly subjected to grazing or floods which would wash them out.

On range lands in most instances it would be well to await the results of natural recovery due to improved management, determining after one or two years where plantings are needed unless conditions clearly indicate that planting should be done earlier. Natural recovery under protection from stream bottom fencing often gives surprisingly good results. Plantings on stream bottom fenced areas which are properly selected have an excellent chance to do an erosion control job. Stream bottom fencing is an important regional practice as noted in Mr. Calkins' memorandum of October 20, 1937 on "Treatment of Canyon and Stream Bottoms".

There are many species to use depending upon site conditions as may be noted from the chart on page 18. Planting in gullies presents such a wide range of conditions that in many cases advice on spacing and arrangement for each locality should be obtained from a forester or biologist.

Plantings are needed on fans threatening farm land and for portions of washes above fans. The purpose is to establish a catchment area for gravel and rock and to tie up with vegetation the area

STREAM SECTION SHOWING BANK PROTECTION
AND BARRIER - HEDGE PLANTINGS



affected. The area must be fenced for livestock exclusion. Where waterways below fans require dikes to protect farm lands they should be planted to protect the earth dikes from washing.

Species for fan plantings in the southern part of this region at lower elevations are drummond scapberry, squawberry and desert willow. At higher elevations use squawberry and New Mexico olive. Other species may be locally indicated.

Miscellaneous Types of Plantings

Dune stabilization. Occasionally it may be necessary to stabilize dune areas which threaten farm land, structures, etc. Such plantings will not follow any prescribed form or type but will depend entirely upon local conditions. Special emphasis should be placed on the selection of soil-binding, drought resistant, native species or proved exotics which can withstand dune conditions. Since such plantings are of a specialized nature the area technical coordinator should approve them before execution.

Frequently soil saving dikes and other structures should be planted to protect them and extend their useful life. While planting may not be possible immediately after construction or even the first year it may often be accomplished after the site is improved through silting and the accumulation of additional moisture.

On page 18 is a tabulation of tree and shrub species with values and recommendations for use. This chart should be helpful in selecting species to use in various situations. Black locust should not be planted in Eastern New Mexico or Western Colorado due to presence of the locust borer.

Planting Plans

Planting plans provide a basis for nursery stock requests and for native material and cuttings. The plan should furnish understandable information to the planting foreman and constitutes a permanent record providing information for later evaluation of results. The plan should provide clear, concise information as to what and where to plant.

The planting form, page 17, should be made up in the field by the planning technician. The reverse side may be used for additional sketches showing species arrangement or other information. A planting plan is made up for each planting location therefore there may be several plans for one holding.

It will be necessary to keep a posting of planting materials on approved agreements to form a basis for stock requests. The Nursery Division must have this information as a guide in its production

program. Planting materials on unapproved agreements should be posted as these agreements become approved. Reporting on needs to the regional office is covered in Regional Bulletin No. 26, Woodland Series No. 6, revised November 1940. Unit and district requests will be assembled in the Area office, for final tabulation, posting, summarizing and for transmittal to the regional office.

(REVISED OCTOBER 1940)

WOODLAND FORM NO. 1

Area _____ Agreement No. _____ Plan No. _____

Field No. _____ Type _____

Cooperator _____

Plan By _____ Date _____ (Acres _____ (Lineal Ft. _____

Purpose _____

Sketch Map or Notes Sec. _____ Twp. _____ Range _____

Supervisor _____ Date _____ Acres Planted _____ Lineal Ft. _____

Foreman _____ Depth of Soil Moist _____

Soil Preparation _____

Planting Method _____

Quality of Stock or Seed _____ Source _____

Number of Plants or Lbs. Seed

Species	Estimated			Actual		
	SCS	Coop.	Total	SCS	Coop.	Total
TOTAL						

*

		Estimated		Actual	
		SCS	Coop.	SCS	Coop.
Super.	Man Hrs.				
Tech.	Man Hrs.				
Labor	Man Hrs.				
Truck	Miles				

NOTES - Spacing and Arrangements - Special Conditions

Use other side for sketch or additional notes.
Attach to Work Order

*Filling in of man hour information block optional with area technicians depending on local application and needs.

#280

TREES AND SHRUBS TO USE IN REGION 8

Species	Shrub or Tree or Vine (S-T-V)	Altitudinal Range Ex. (6.5) up to 6500' (4-5) 4000-5000'	Alkalinity Resistance H. or L. or M	Use for Bank Protection	Plant on Irrigated Land	Use for Windbreaks on Dry Farm 14"+ Rainfall	Use for Gully Control Small Gullies & Good Moisture	Do Not Plant Next to Field Crops	Value for Wildlife Food H-high, M-med., L-low	Value for Wildlife Cover H-high, M-med., L-low	Good Post Tree	Fuel Value H-high, M-med., L-low	Possesses Other Farm Uses	Usable Fruit	Use to Tie up Fans Threatening Farm Land
1. Ash, Green	T	6.5	L		X	X			L	M		H	X		
2. Buffaloberry	S	4-8	H		X	X	X		M	H					X
3. Catalpa, Western	T	6	L		X				L	L	X				
4. Chokecherry, Western Black	S	6-9	L		X	X	X	X	H	M				X	
5. Elder, Blueberry	S	5-8	L		X		X		H	M				X	
6. Elm, Chinese	T	7	L			X			L	L		M			
7. Himalaya Berry	V	4	L		X		X		H	H				X	
8. Locust, black	T	6	L		X		X	X	M	M	X	H	X		
9. Locust, honey	T	6	L		X				M	L	X	H	X		
10. Locust, New Mexico	S-T	6-8	L				X	X	M	M					
11. Mesquite	T	4	L						H	H	X	H			X
12. Mulberry, Red	T	5	L		X				H	M	X			X	
13. Olive, New Mexico	S	6	H				X		H	H					X
14. Olive, Russian	T	6.5	H		X	X	X		H	H	X	M			X
15. Osage Orange	T	5	L		X		X	X	M	H	X	H	X		
16. Persimmon	T	5	L		X		X		H	M		M		X	
17. Plum, wild	S	7	L		X		X	X	H	H				X	
18. Pomegranate	S	4	L		X		X		H	H				X	
19. Ponderosa pine	T	7-9	L		X	X			M	M		M	X		
20. Poplars, various native	T	varying	H-L			X		X	L	L		L			
21. Prunus besseyi	S	6	L		X		X		H	H				X	
22. Rocky Mountain red cedar	T	5-8	L		X	X			H	H	X	M			
23. Rocky Mountain sumac	S	5-8	M				X	X	M	M					X
24. Rose, various native	S	varying	L				X		H	H					
25. Serviceberry, various native	S	5-8	L		X	X	X		H	H				X	
26. Soapberry, Drummond	T	4	L				X		L	H					X
27. Squawberry	S	7	M		X	X	X		H	H					X
28. Virginia creeper	V	10	M				X		M	H					
29. Walnut, black	T	6	L		X				L	L				X	
30. Wild Gourd	V	6	M				X		L	M					X

(OVER)

TREES AND SHRUBS TO USE IN REGION 8 (Contd)

Species	Shrub or Tree or Vine (S-T-V)	Altitudinal Range Ex. (6.5) up to 6500' (4-5) 4000-5000'	Alkalinity Resistance H. or L. or M	Use for Bank Protection	Plant on Irrigated Land	Use for Windbreaks on Dry Farm 14"+ Rainfall	Use for Gully Control Small Gullies & Good Moisture	Do Not Plant Next to Field Crops	Value for Wildlife Food H-high, M-med., L-low	Value for Wildlife Cover H-high, M-med., L-low	Good Post Tree	Fuel Value H-high, M-med., L-low	Possesses Other Farm Uses	Usable Fruit	Use to Tie up Fans Threatening Farm Land
31. Willow, Desert	S-T	5	L				X		L	M	X	M			X
32. Willow, Crack	T	7	H	X				X	L	H		L			
33. Willow, Dudley	T	4	H	X				X	L	H		L			
34. Willows, shrub native	S	varying	H-L	small washes			X	X	L	H					X

Policy on Use of Woody Plant Materials

Planting plans should be based on needs and planting possibilities and should not be limited to the requirements of soil and moisture conservation. Present woodland stands, the type and quantity of products these stands can supply to meet the needs of the landowner, and improvement of wildlife conditions should be considered. Planting stock to be furnished by the Soil Conservation Service should be based on soil and moisture conservation needs. Distribution of Soil Conservation Service nursery stock for plantings about farmsteads or for ornamental purposes is prohibited.

There are in effect at present two policies under which the SCS can furnish planting stock. One policy applies to soil conservation districts and the other to cooperators outside districts. These two statements of policy follow:

1. Policy under which the Soil Conservation Service may furnish stock to soil conservation districts.

On page 9 of D.C. 19 entitled "Principles and Procedures for Soil Conservation Service Assisting Soil Conservation Districts" it is stated that planting materials may be furnished if they are either (a) improved or uncommon, or (b) not generally within the economic reach of owners and operators of land within the districts, or (c) not generally available in regular trade channels to owners and operators of land within the district, or (d) materials particularly necessary to prove or demonstrate measures or practices appropriate for erosion control and soil conservation work.

Note that one or more of these points will be used to determine quantities of woody stock to be supplied to district cooperators through the district. Woody planting stock is not generally available in regular trade channels in New Mexico and Arizona. This means that the Soil Conservation Service may supply, without limitation as to quantity, planting stock needed by districts in New Mexico except cuttings or other planting materials in instances when the cooperator can and agrees to furnish them. If and when districts are established in Arizona the same policy will apply.

For Utah and Colorado, if it is locally determined that planting stock supplied by Section 4 Clarke-McNary Nurseries is within the economic reach of landowners cooperating with soil conservation districts, it will be expected that landowners will obtain from this source the stock available. Planting stock commonly available from Section 4 nurseries in these two states is listed on the following page:

Utah	Colorado
Siberian pea tree	Boxelder
Russian olive	Siberian pea tree
Green Ash	Eastern hackberry
Honey locust	Russian olive
Black walnut	Green Ash
Black locust	Honey locust
Golden willow	Sargent's poplar
Siberian elm	Wild plum
Ponderosa pine	Golden willow
Eastern red cedar	Siberian elm
	Rocky Mountain red cedar
	Ponderosa pine

In the event the supply from Section 4 sources is exhausted for the species noted, the Soil Conservation Service can supply stock from its own nurseries. For species other than those listed the Soil Conservation Service can supply requirements to the extent of available stock.

Planting material which fails may be replaced to the extent required for a satisfactory stand by the Government and the cooperator in the original ratio provided the planted area has been maintained in accordance with the terms of the agreement.

2. Policy under which the Soil Conservation Service may furnish stock to cooperators outside soil conservation districts, see Field Memoranda #762 and #762-A.

A. Uncommon woody planting material not ordinarily available through regular trade channels may be furnished in accordance with the land use plan approved by the Soil Conservation Service. All stock for use in New Mexico and Arizona is considered to be uncommon with the exception of cuttings or wildings that can and should be obtained locally.

B. Common woody planting material may be furnished in accordance with the land use plan approved by the Soil Conservation Service under the following conditions:

1. If the total number required to be planted is 3,000 or less, the entire amount may be furnished.

2. If the total amount required is more than 3,000, 20 percent of the total may be furnished or 3,000 whichever is the greater.

Of the remainder required, 50 percent may be furnished by the Soil Conservation Service if the cooperator provides an equal number. Wildings, seed spots or cuttings of suitable quality and species as required in the farm plan may be matched with Government grown stock. The total amount of woody planting stock supplied by the Service under any one agreement should not exceed 25,000.

3. For Utah and Colorado common stock has previously been listed. All other planting stock is uncommon. The farm planner should total the quantity of common stock for an agreement to determine that portion to be supplied by the cooperator in accordance with the policy noted.

C. Planting material which fails to establish a satisfactory stand may be replaced by the Government and the cooperator in the original ratio, providing the planted area has been maintained in accordance with the terms of the agreement.

This policy establishes the maximum quantity which may be furnished by the Government.

Cooperators can order from Clarke-McNary or private nurseries trees and shrubs to supply stock, to be furnished for erosion control or stock for planting on non-eroding lands to meet needs for wood products.

In Utah and Colorado landowners can obtain planting stock supplied under the Clarke-McNary program at nominal cost through the state extension foresters at Logan, Utah, and Fort Collins, Colorado. Annually each area office should obtain order blanks and a price list showing available stock and cost. Sufficient copies should be secured for supplying each district or unit office.

In New Mexico distribution of planting stock is made by the Colorado extension forester through New Mexico county agents. Purchasers in New Mexico must pay the cost of transportation.

Clarke-McNary stock cannot be obtained in Arizona at present.

There is nothing difficult about producing most trees and shrubs from seed. Fall planting is best for some seed, spring planting for others. Consult a forester for further details on when to plant

seed of various species and the selection of trees from which seed should be gathered.

Some cooperators can be interested in collecting seed as the quantity required will often be small. If they collect seed and produce planting stock, themselves, they can get the AAA payments indicated for tree planting.

Tree and shrub seed should if possible be planted in the cooperator's garden patch where he can take care of watering and cultivation.

Cooperators should be encouraged to furnish willow cuttings as they can usually obtain this material on their own or on adjoining lands. Cuttings should be made in early spring before the plants leaf. They should be heeled in or be planted immediately.

Planting Organization and How to Plant

No planting should be done until plans are made.

Rooted stock and cuttings should be planted while they are dormant, preferably in early spring. Past experience indicates that fall planting is not generally satisfactory. Planting of cuttings and rooted stock in late winter is feasible in Southern New Mexico, Arizona and Utah.

A good planting program largely depends on training, organization and supervision. It will be necessary for planners to give field supervision during the planting season. The inspection report given in Regional Bulletin No. 26 should be used in connection with foremen training and supervision. Foremen must be instructed in how to read planting plans, how to plant and how to organize planting crews to get work done efficiently. Crew training in planting techniques is also essential. Foremen must be given supervision. Also the best foremen should be assigned to planting.

When trees are received place them in a heeling-in bed, e.g. prepare a trench preferably in sandy soil about 18 inches deep (or deeper for large stock) with one side sloping about 45°. Plants are arranged in a thin layer along the sloping side of the trench and covered with moist earth halfway up the stems. The soil is tramped to eliminate air pockets and a second layer of plants follows. Plants should be watered and the roots kept moist until removal. Remove straw and similar material from plants prior to placing in heeling-in beds to avoid mold.

When the planting site is not in proper condition for planting or when stock is too small for field planting, it may be desirable to line out stock to hold it over a full growing season. Stock can be lined out in plow furrows and should be irrigated although this is not

absolutely essential on dry farm lands if clean cultivation is practiced.

Successful planting of rooted stock requires attention to the following rules:

1. Roots must be kept moist from the time trees are removed from the heeling-in bed until planted in moist soil. During transporting, the plant roots should be packed in wet burlap or moss, preferably in boxes to prevent drying. Water should be used as needed to keep the plant roots moist.

2. Planters should carry plants in pails with the roots covered with water or wet burlap. Plants removed should be planted immediately.

3. Holes should be made deep enough to accomodate the main root without bending it. Dirt removed from the hole should be placed for handy use in one pile and not scattered. Do not dig holes too far in advance of planting as they dry out.

4. Hold the plant in the hole with the root collar one-half to one inch below the surface (rooted willow cuttings can be planted much deeper) and place enough soil to hold the tree in position. Pack the soil firmly around the roots. Fill in the rest of the hole and pack firmly.

Planting tools to use are (1) shovels for hardwood and large coniferous stock and (2) mattocks for small coniferous stock.

When planting cuttings, the vertical, angular and horizontal methods are used. The base of vertical and angular cuttings should reach permanent moisture, therefore the length ef cutting depends upon planting site conditions. If permanent moisture is available near the surface, a six inch cutting may be satisfactory. In other cases a 5 or 6 foot cutting may be needed especially with tree willows where silting will occur. Shrub willow cuttings will usually be 2 feet or less in length.

In general cuttings should not extend more than 3 or 4 inches above the ground unless planted where heavy silting is expected. Cuttings of small diameter should be planted so that not more than one or two inches appears above the ground surface.

Angular cuttings are used for planting sloping banks. The method of planting vertical and angular cuttings varies considerably. In some places the cuttings can be pushed into the ground to the desired depth. With cuttings or larger diameter, holes may be made with a shovel or post hole digger or the cuttings driven into the ground. A pointed 3/4 inch crow bar may be used to make a hole into which the cutting is placed.

In horizontal planting, the cutting is placed in a shallow trench or may be pressed into boggy ground leaving the upper portion exposed. They may be anchored with wire butterfly knots. Horizontal planting has been used successfully where planting sites are too wet to expect successful results from planting vertical cuttings.

There are many other methods of using cuttings. Bundles of shrub willows may be placed in shallow trenches and anchored. Willow brush may be placed in trenches and partially covered with earth, or other variations may be used depending upon sites and danger of loss from floods.

The statements on planting organization and techniques given here are necessarily brief. For more detailed information refer to Regional Bulletin No. 26, Woodland Series No. 6.

Planting Results

To improve the planting program it will be desirable to observe each planting during the current year. During the course of such examinations which can be made largely in connection with other work, the planner can note the effectiveness of the planting in terms of controlling erosion, the growth and vigor of the trees, variations in survival of different species, etc., all leading to suggested changes in planting arrangement, use of different species, etc., so that improvement can be made in succeeding plantings. Evaluation card No. 18 should be made out at the time of planting on study areas selected. Subsequent examinations may be recorded on card No. 18-A.

The quantity of various species needed for replanting should be noted.

Carefully made photographs of conditions before and after treatment are important to show progress.

A planting report should be made to the Area Office by December 1 of each year covering plantings made during the year. The form of the report will be as follows:

Annual Planting Report

Unit or Soil Conservation District Date

1	2	3	4	5
Type of Activity L.U. Projects, Conservation Districts, etc.	Total Acres in the Plantations Sampled for this Report	Acceptable Plantings Acres	Unacceptable Plantings Acres	Percent of Total That Are Unacceptable Col. 4 - Col. 2

This report will be based entirely upon observational studies and will be summarized by states. A planting is considered acceptable if no replanting is required or if only a little replanting is necessary to make the planting effective. In all other cases plantings will be considered unacceptable and will be so recorded. Replantings will not be covered by this report.

If the report for any unit or district indicates that the unacceptable plantations constitute 50 percent or more of the area planted a statement will accompany the report bringing out the reasons for the high percentage of unacceptable plantations.

Follow up and necessary replanting are just as important as the original planting as the effectiveness of the entire control job may be dependent upon having no breaks in the vegetative protection.

Management of Existing Woodlands

Introduction

A well-managed stand of trees is one of the most effective types of cover in preventing soil erosion. This is particularly true of much of the steeper land in Region 8. This function of forest cover is well recognized by planners of this region. Not so well known or appreciated is the importance of woodlands in the farm and ranch economy of the region.

Much of the woodland grows on range units from which an annual income is derived from livestock production and grazing is also practiced on predominately sawtimber forest areas. Placing the emphasis on livestock production and annual income has resulted in misuse and neglect of the forest resource but has not prevented cutting of fuel, post, sawtimber and other products from the land although more often than not the landowner received only a portion of the real stumpage value. While grazing is producing annual income, trees growing on the land, add volume annually which over a period of years may add materially to the value or income of the land. Often this value has not been recognized, especially in the slow growing pinon-juniper type. In many areas fuelwood and posts have been used or destroyed to such an extent that present needs cannot be filled or can be met only by adding high transportation charges for commodities formerly close at hand.

Areas which are to remain in woodland as determined from land use capability and economic studies should be managed so that the full productive power of the soil is being utilized in the development of the most valuable species and the highest quality products insofar as this type of management is economically feasible. The timber stand can generally be built up to such an extent that the

products needed for home use and those available for sale contribute a substantial part of the farm and ranch economy. Home needs can often be supplied from improvement cuttings or from inferior or unsalable material leaving the better classes for sale.

The Job to be Done

Having determined that certain fields or pastures which are now in woods and are to be maintained in this cover, the Soil Conservation Service has a responsibility for assisting the landowner in understanding how to manage these fields so that they will contribute to farm and ranch income and stability.

The problem is to show the landowner, (1) that it is in his interest to so manage his woods that it will be useful not only in preserving soil and moisture and preventing erosion, but will continuously contribute its share of the farm or ranch income, and (2) how to make a start in that direction. The woodland management plan, incorporated in the conservation plan for the holding should include specific statements covering the products to be grown (the objectives) and the initial operations to reach the goal. It is usually sufficient to indicate the silvicultural operations for a 5 or 10 year period in the future on the assumption that further directions for extending the management practice must be based upon a re-examination of the woods at the end of the first period.

What We Have to Sell

Primarily we have to sell an appreciation of woodland values and if we succeed in that the landowner will work out the detailed practices himself taking advantage of any public assistance available whether from the Soil Conservation Service or from other agencies. The Cooperator must appreciate the value of developing productive farm woodland to be managed as a farm crop to be harvested at intervals of varying frequency depending upon species and market conditions.

What Cooperators to Work With

We should attempt to interest all cooperators who own woodlands in carrying out good management practices. The minimum might be provisions for soil and moisture conservation, such as fire and grazing protection, the leaving of seed trees and the marking of small areas in different types for guidance of the landowner in cutting. Naturally we need to devote more attention to cooperators who are especially interested or who have more difficult problems.

Some cooperators are chiefly interested in the sale of all merchantable forest products in order to realize an immediate income regardless of the sacrifice of the growing stock. This may possibly be good business for them and if properly conducted such cutting is not necessarily

contrary to conservation principles. It is not, however, the type of woodland management the Soil Conservation Service is trying to encourage.

For all farmers and ranchers who are willing to undertake management to provide a regular flow of materials to supply personal needs or to provide a regular periodic income, the Soil Conservation Service will undertake to give initial guidance in the form of a plan for cutting and some help in marking trees, but we cannot supply the technical assistance to carefully mark all the timber to be cut or to supervise cutting operations.

What to Do

The planner looks at the woodland as a part of the land holding to be developed, protected and tended to the extent that the owner or tenant can be interested and in proportion to the ability of the woodland to contribute to the welfare of the farmer. This contribution may be indirect, e.g. its influence on frost, wind, prevention of erosion, its value for wildlife and recreation, or direct, in the monetary returns to be obtained, or part of both. The steps to be taken by the planner may be listed as follows:

1. Get an estimate of the average annual farm needs for forest products such as poles, posts, fuel, lumber and timbers for construction and repair of buildings, fences, tools and implements. See suggested form page 28.

2. Talk to the landowner about other values of the woods to determine what appreciation he has now and what can be stirred up by the conversation.

3. Get an idea of how much labor is available which might be used in woods work and how much he has to pay out in cash for taxes, interest and similar fixed and recurrent expenses.

4. After a preliminary examination, go through the woods with the landowner and size it up from the standpoint of its ability to produce the things (direct and indirect) which he needs. Talk to the landowner about possibilities of sale of certain products, about relative values in trees of different sizes and different species. The use of an increment borer or observation of the rings on a few fresh stumps will indicate to the landowner the rate of growth his timber is making and the inadvisability of cutting trees before they reach economic maturity. Point out opportunities to speed up growth on the better trees by thinning or to improve quality by pruning.

#1323

WOOD UTILIZATION SURVEY

Forestry Div., Reg. 8
January 1940

Cooperator _____ Agreement No. _____
State _____ Size of Farm _____ Acres
Area _____ Area in Woodland _____ Acres
Work Unit _____

I. Fence Posts

a. Miles (to nearest tenth) of fence to maintain _____ Miles
b. Average No. of posts per mile _____
c. Total posts in use (a x b) _____
d. Kind or species of trees used for posts (note if treated)
_____
_____
e. Length of life of posts (use averages) _____ Years
f. Average annual replacement (c ÷ e) _____
g. Cost of annual replacement (f x unit cost) $ _____

II. Fuel Wood

a. Cords (128 cu.ft.) of fuel wood used annually _____ Cords
1. Species used _____
2. Total annual value processed f.o.b. farmstead $ _____
b. Tons of coal used annually _____
1. Total annual cost f.o.b. farmstead $ _____

III. Lumber

a. Amount of rough lumber used annually (barn boards, planking, etc.) _____ Bd. Ft.
1. Value f.o.b. local mill $ _____
b. Amount of quality lumber used annually (finishing, etc.) _____ Bd. Ft.
1. Value f.o.b. retail yard $ _____

IV. Other Wood Products (Poles, Timbers, Etc.)

a. Annual amount (in cords, bd. ft. lineal ft., etc.)
_____
_____
1. Value $ _____

V. Summarization

Class of Wood Products	Annual Needs	Quantity Available from Nat. Forests or Grazing Service Lands	Balance
a. Fence Posts			
b. Fuel Wood			
c. Lumber			
d. Other Wood Products			

EXPLANATION AND USE OF FORM

Utility values to be expected from present or proposed forest areas are important to show land owners one form of use that may logically apply to their lands. Often the owner wants to know what he can expect from existing forest stands or from plantings.

The purpose of this form is to provide information to arouse interest in the development, maintenance and protection of farm woodlands.

With the exception of Item (I-d), all of the information under I can be obtained in the office. The length of fence can be scaled from the map in the cooperative agreement, remembering that as a rule a farmer maintains but half of his boundary fences. The mileage of fence on irrigated and on dry farm and range lands should at first be considered separately since length of life of posts is affected by differences in soil and moisture conditions. Number of posts per mile is a rather constant figure for any given locality. Length of life of various species of posts can be determined from the table accompanying this form with such adjustments as you deem satisfactory. Where steel posts are used, the range of life may vary from 7 to 30 years, depending upon the kind of post and where it is used.

Items under (II) can be obtained by questioning the cooperator. Notice that it is necessary to show stovewood in terms of standard cords.

The landowner will usually be unable to answer the question of how much lumber he uses annually. However, the technician can direct the landowner's thinking to furnish reasonably accurate answers, i.e. when was the last lumber purchased or sawed? How long before that did he buy or cut building material? Are new buildings contemplated? How much lumber was or is going to be used in specific buildings? Distinguish lumber that may be grown or manufactured locally and specialized material, as flooring, siding and other planing mill products of species not available in the immediate locality.

Item (IV) includes such products as poles, vigas, rough hewn timbers, etc.

Item (V) presents among other items the proportion of annual needs that can be continuously supplied from nearby National Forest or Grazing Service lands. Depending upon the opportunity afforded, products formerly obtained from these sources may in the future, in whole or in part, be provided from cooperator's lands.

This survey includes only material <u>used</u> on the farm or ranch; do not consider amounts cut for sale or use on other holdings.

This form should be filled out for each cooperator.

Call attention to the natural law that if continuous production is maintained, there must be found in the woods trees of all sizes and in some instances of more than one species, from seedlings to mature trees. The importance of developing and maintaining favorable soil conditions for tree growth should not be overlooked. Point out the injurious effect of fire and overgrazing on soil conditions.

5. Come to some conclusion about what the landowner should do to develop his woods in accordance with the various ideas discussed, and encourage the landowner to take an active part in formulating the plan. In other words, attempt to set up with the landowner a goal or an objective of management and agree on the initial steps he will take looking toward the accomplishment of his goal. Where unusual or difficult management problems are involved which the farm planner cannot handle, he should ask for forestry assistance.

Planning Needs and Examples of Average Problems and Suggested Action

The preparation of woodland management plans call for a diagnosis based on examination and analysis of the woodland. The plan prepared is a prescription covering treatment as a result of this diagnosis.

For the purpose of this discussion, woodland plans will be divided into three types as follows:

1. Plans providing for minimum erosion-control requirements. This would include protection as required from fire and overgrazing and prevention of over-cutting as applied to erosion control rather than sustained or economic yield.

2. Silvicultural plan where the practice of good silviculture is all that is practicable at the present time.

3. Regulatory plan providing for sustained yields on stands where there is a possibility of an overcut.

In preparing the plan of conservation operations, the forestry management stipulations included in the cooperative agreement must necessarily be brief. The minimum requirements covered in the first type of plan should be included in the agreement while any additional material, such as suggested silvicultural practices or a more complete fire plan, may be referred to in the agreement and submitted as supplemental material. For the second and third types of plan the same minimum requirements, insofar as they apply will be included and in

addition it is advisable to include in brief form the most important points of the management plan. The detailed plan will be supplied as a supplement.

For stands where regulation is not required, but where some cutting may be done a silvicultural plan will be prepared including cutting rules and practices applicable to the individual stand. Stands to which this type of plan applies include:

1. Young timber where little or no cutting is to be made within the next ten years.

2. Mature timber which could be sold but no cutting is contemplated except for minor needs well under current growth. For a stand of this type, provision should be made in the cooperative agreement for assistance at a later date in case cutting is contemplated. A regulatory plan might be made on some stands of this type for purposes of developing woods appreciation.

3. Over-mature stand which is to be cut but where regulation is not practical. Cutting in accordance with approved silvicultural practices will leave the stand in the best possible condition for future production and for soil protection. One example of this nature might be stands consisting of young reproduction and over-mature trees with no intermediate trees.

Regulatory plans are applicable to stands having a sufficient distribution of age classes to permit harvesting the growth at fairly regular intervals, either yearly or periodically. Cutting for home use is usually on an annual basis, while cutting for sale is normally periodic for small holdings which are not of sufficient size to permit annual economic cuts.

For annual cuts or periodic cuts for periods of ten years or less the system presented by Mr. Rupp should be used.* For longer periods growth studies of the stand will be used to indicate the periodic cut but silvicultural checks will be applied in determining the cut.

While it is impossible to cover all types of problems a few of the more typical examples are described below together with recommended action. As conditions vary action called for will also vary.

Sawtimber Stands

Merchantable timber stands usually require a regulatory plan which is based upon a fairly intensive survey. Because of the technical aspects of this phase of planning the services of a forester should be requested.

*See List of References

In unmerchantable stands such as cut-over stands and stands below merchantable size, except for a few larger size trees, protection and non-use or limited use based on silvicultural marking rules or stand improvement is indicated.

Regulatory and silvicultural plans require technical forestry knowledge. Until the planner is thoroughly acquainted with factors involved in their preparation the services of a forester should be requested.

Stand Improvement

The purpose of stand improvement is to increase the economic value of timber stands. If this can be demonstrated to the owner he will probably continue to maintain and improve the forest cover.

It is often the case that the owner does not intend to remove any live trees at the time an examination is made of his area. If so, a stipulation should be entered in the plan to the effect "The cooperator agrees to follow marking practices recommended by the S.C.S. (or District Supervisors) for the removal of all living trees." Marking rules referred to can be supplied as a supplement. In the event the landowner intends to cut live trees within the next five years, a marking plot of small size (1-2 acres) should be established in which the material to be removed will be indicated. A stipulation to the effect that the cooperator will follow the marking practices recommended as shown by numbered marking plots on his property should be included in the plan of conservation operations.

If possible these marking plots should not immediately be cut over for products, since they form a location of reference as to proper marking practices. One or more may be needed depending on stand conditions, forest types and the kind of products desired.

Improvement of woodland stands may be effected in whole or in part in connection with other control operations. Over-mature, deformed trees may be removed for release of advance reproduction to supply brush needed for erosion-control structures or gully treatment. Brush from products cut for fencing or other purposes should be used most effectively. Differing situations require differing action, and technicians should be alive to possibilities presented for stand improvement work that can be accomplished, the charges to be made against the major purpose for which the material is to be used.

Pinon-Juniper

At lower elevations over a large part of Region 8, juniper is predominant, often occurring in original stands or as young growth encroaching on areas formerly in grass. In two of the most typical situations juniper occurs as (1) as isolated trees or open pure stands

in well-sodded areas, or (2) in mixture with pinon on slopes whose other vegetative cover was originally in delicate balance but is now largely destroyed by excessive range use.

In the first case, we might obtain agreement of the owner to maintain the type; however, this agreement is not essential if the requirements of soil conservation are otherwise properly effected.

In the second case, it would be a requirement that the woodland be maintained with stipulations as to use of material so as to provide necessary protection to the site by the woodland cover.

If it can be shown that the woodland cover should be maintained through continuing need for posts, fuel or other products by the owner and where the requirements of soil conservation cannot be adequately taken care of without the presence of the woodland stand, the plan of conservation operations should present the following stipulations:

1. The cooperator agrees when cutting post material to cut the minimum necessary amount from each tree clump to obtain the products desired. He will limit cutting to mature and over-mature trees, reserving vigorous young growth for future needs.

2. Removal of material for fuel wood by the cooperator will not necessitate removal of entire trees, except in instances when old, over-mature trees should be taken or existing reproduction needs release.

3. The cooperator agrees to use all brush from cutting by first placing this brush in gullies and old roads adjacent to the cutting area. After these needs are met, the brush will be scattered on areas of limited grass cover. All brush will be cut to lie not over 18 inches above the ground.

4. The S.C.S. (or District Supervisors) offers technical advice to the cooperator, when available, to assist him in methods of selecting and harvesting wood products.

The above stipulations can also be used when their inclusion in the P.C.O. is not essential for erosion control but where they are concurred in by the landowner after he agrees it is desirable to maintain the stand to provide useful products.

Stipulations of a more stringent nature must be included where woodland stands are in localities of active erosion.

With increasing elevations, the woodland types will provide greater soil protection and naturally play a larger part in conservation plans. To provide for soil-conservation needs, use stipulations must be included in the plan of conservation operations if the woodland cover is to continue to fulfill and augment its function of soil conservation.

Pinon-Juniper Surveys

While posts may be cut in limited quantities on the basis of silvicultural cutting rules or on an improvement basis, actual surveys should be made to determine a fair estimate of stand condition, volume, and growth where posts are found to have importance from the standpoint of the owner's needs or for income from sales. Examples have been noted where posts were considered as having very little value by the owner when a subsequent survey showed good posts were available in sufficient quantities to allow an annual cut of several hundred indefinitely. Where salable material is involved the market situation is very important from the standpoint of survey needs and will be investigated prior to making surveys. In any case however a survey showing substantial values will be helpful in selling good management to landowners.

Where only dead wood is used or green wood in amounts obviously below annual growth, surveys are not required, but where cutting of green wood appears to be in excess of growth, a survey should be made to furnish an estimate of growing stock and permissible annual or periodic cut. Survey procedure is covered in Bulletin No. 70.

Where surveys are made, the plan should give an estimate of the amount of material by various classes depending on merchantable products involved. This might be in cords or in posts according to top diameter classes. An actual example is given below where the product cruised was juniper posts.

"In the 320 acre of pinon-juniper woodland, alligator juniper is the most abundant post species. Some one-seed juniper (brown cedar) is present in the type. The survey shows the following material of post size:

Material of Post Size
by
Class and Top Diameter Sizes

Corner posts 7" top	6,300
line posts 4" top 3" top	 18,900 11,500
Total line posts	30,400

In addition to material now of post size the survey shows:

1.	4,000	line	posts	available	over	the	next	10	year	period.
2.	9,800	"	"	"	"	"	"	20	"	"
3.	10,200	"	"	"	"	"	"	40	"	"
Total	24,000	"	"	"	"	"	"	40	"	"

and 350 corner posts available over the next 10 year period.

The total estimated number of posts available now and within the next 40 years amounts to:

6,650 corner posts
54,400 line posts

The average annual cut indicated amounts to:

165 corner posts
1,360 line posts

Advantage should be taken of market conditions which means that the annual cut for a given year may be above or below the figures noted.

When cutting juniper posts all large trees (those containing 3 or more posts) should be cut before the smaller trees of 1 or 2 posts are harvested. By so doing post production will be increased as the older trees are making the least growth.

Where several stems are growing from one stump only those stems that will make desirable posts should be cut. Stems that are too small or those that will produce additional posts within a few years should be left to continue their growth.

If fence posts are removed from the property, all junipers within 100 feet of the boundary fence having a top diameter below 5 inches, seven feet above the ground should be left for future use in fence maintenance."

Wherever possible, trees should be harvested first, whose removal will release young growth, particularly young juniper.

Immature juniper stems having post length should be selected for leaving when cutting fuel.

Mesquite

Mesquite sprouts readily and can therefore be handled quite satisfactorily on a diameter limit and area basis if the stand is largely even aged or of uniform character. The rotation age of mes-

quite is about 30 years which produces material with a diameter of approximately eight inches at one foot above the ground. Using the 8" diameter as a minimum size for cutting and dividing the area to give approximately equal annual or periodic cuts would give a basis for regulation of cut. The terms of the agreement would outline the area to be cut each year or 5 year period as desired and restrict cutting to an 8 inch diameter limit.

Where there are quite a number of very large size trees it would be well to take the cut from these trees over the whole area during the first cutting period. Under such conditions an estimate of volume will be needed te furnish a guide to cutting. This will also be true for many cut-over stands, where these conditions exist the services of a forester should be requested to help develop a cutting plan.

The Woodland Plan in the P.C.O.

The P.C.O. should contain a statement of the objectives of management similar to the examples already given plus whatever specific treatments are required, e.g., the building of a fence or a fire line or a road. Wherever the statement of management objectives is not sufficiently specific for inclusion in the P.C.O. a separate memorandum or letter should be given the farmer. In some cases, it may be desirable to indicate specific silvicultural operations to be carried out during the next 5 years, such as thinnings or underplantings or release cuttings. Where desirable a statement as to the location and amount of yearly or periodicial cut for the next 5 or 10 years should be included.

Follow Up

While foresters will assist on plant preparation for the more difficult problems, follow-up will in many instances be the responsibility of the farm and ranch planners. It is suggested that the planner or forester show the farmer what trees to select for cutting, (preferably at the time of planning) and then let him alone except for occasional visits. Once the farmer gets the idea of recommended practices, he will need mostly encouragement and assurance that he is on the right track.

Technical Forestry Aid to Farm Planners

Our main job in farm planning is to give to the farmer a new idea of how he can better the permanent productiveness of his land. In woodland management, some farmers, and particularly some woodlands, offer complications and provide opportunities which can best be met by a specialist in ferestry. The conditions will be recognized by planners who should request technical aid. Farm or ranch planners who are foresters will require additional time to plan those holdings with woodlands involving technical analysis.

Regional Bulletin No. 63 covers policy and practices governing cutting and use of brush in erosion-control work. While it was prepared primarily as a guide in SCS operations it should also be applied where cooperators are doing their own cutting and erosion-control work.

The rest of this handbook will be devoted to a presentation of supplemental material to aid in doing the job which has been outlined in the foregoing pages.

Area Forestry Technicians should prepare additional criteria and guiding material as needed applying to the local problems of each unit for guidance of the Unit or District Conservationist.

Helpful Suggestions for Farm and Ranch Planning

Crop Tree Selection, Thinning and Pruning in Ponderosa Pine Stands

Selection of Areas

"Stand improvement is usually more needed in stands in which the trees are widely spaced than in dense stands. It should be confined to good sites, to areas that are accessible to market, and to stands capable of responding to treatment. Best results are obtained in young stands in which most of the trees are less than 9 inches in diameter breast height*.

Crop Trees

"Only thrifty, well-formed trees should be selected as crop trees. Avoid trees with crooked or forked boles or with coarse limbs. Other things being equal, dominant trees not more than 9 inches in d.b.h. are the best selection for crop trees. In some circumstances, however, it is best to select codominants or trees more than 9 inches in d.b.h. that have relatively fine or few limbs. In fully stocked stands 120 crop trees per acre is about right. On account of incomplete stocking, the average over large areas will seldom exceed 60 per acre. As a rule crop trees should not be less than 15 feet apart, but the distance will vary greatly according to the way the best trees are distributed.

Removing Undesired Trees

"If a crop tree is at least 5 feet taller than its nearest neighbors, no trees need be removed around it unless they are defective or diseased or are within 2 feet of its bole. If a crop tree is not 5 feet taller than its nearest neighbors, enough of the latter should

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*Hereafter noted as d.b.h.

be removed to free the crown of the crop tree on at least three sides. A wolf tree affects crop trees to a considerable distance, and should therefore be removed if within 20 feet of the crop tree. Aside from liberating crop trees, trees that are diseased or of poor form should be removed for the benefit of the stand as a whole.

"Felling -- If a tree is cut, it must be limbed and the brush must be either scattered in open places or, if the fire danger is great, piled and burned. Trees felled between April 1, and November 1, must be peeled to prevent bark beetles from breeding in them. For this purpose it is sufficient to peel in strips, leaving strips of bark not more than 3 inches wide. Trap trees, however, should be completely peeled when the larvae of the bark beetles are about half grown.

"Poisoning -- It is usually cheaper to kill undesired trees by poisoning than to fell them, especially if they are more than 6 inches in d.b.h. Holes 1/2 or 5/8 inch in diameter and 4 to 5 inches deep are bored in the trunk with an ordinary brace and bit. The holes are inclined downward, to keep the poison from running out, and are placed as near to the bark as possible. The number of holes required depends on the tree's d.b.h., varying about as follows: Less than 6 inches, one hole; 6 to 11 inches, two holes; 12 to 16 inches, three holes; 17 to 21 inches, four holes. Unusually large or forked stems call for one or more extra holes. A 15-percent solution of sodium arsenite, made by mixing 6 pounds of white or 7 pounds of gray sodium arsenite powder in 4 gallons of water, is poured into the holes, and within about two weeks the tree dies. Extreme care must be exercised to avoid getting sodium arsenite on the hands or spilling it where it might be eaten by livestock or game. It can be applied efficiently with a long-stemmed battery bulb, and a 4 quart bottle with a mouth just wide enough so that the battery bulb acts as a stopper.

"Pruning -- Preferably, all crop trees should be artificially pruned. As a rule, pruning is restricted to crop trees. In removing limbs it is essential that the cut be smooth and that no projecting stubs be left. In order to produce a clear log 16 feet long the bole should be pruned to a height of at least 17 feet, thus allowing for a 1-foot stump, unless this would reduce the length of the living crown to less than half the height of the tree.

The lowest branches, to a height of about 4 feet, can usually be removed most easily with an axe; a hand saw is better for heights between 4 and 7 feet; beyond 7 feet, a pole saw is needed." (Taken from "Timber Stand Improvement in the Southwest", CCC Forestry Publication No. 6, 1940).

Fence Post Treatment

The sapwood of an untreated post is not durable and the length of service is dependent upon the amount of heartwood.

When posts are to be treated with creosote or other preservative, a round post is preferable to a split post, because of the comparative ease with which the porous sapwood can be treated. Heartwood treats with considerable difficulty. Posts which are to be treated by methods requiring peeling should be cut in the spring. For treatment with creosote the posts are cut, peeled, sharpened, and stacked crib fashion off the ground. This allows air to circulate through the stack. When thoroughly seasoned the posts are ready for creosote treatment. Any common woodlot species can be used offering a chance to use thinnings from the woodlot.

The following method has been found satisfactory in treating posts:

Post-treating plant with farm equipment:

A 100-gallon drum, and 100 gallons of creosote:

Thermometer registering up to the boiling point (212°F)

A 100-gallon drum of good coal-tar creosote can be purchased from most of the companies that supply this product. The 100-gallon drum can easily be made into an excellent post-treating tank by cutting out the head of the drum and setting it up on brick or stone supports, so that a fire can be built beneath.

One hundred gallons of creosote will treat 150 posts. If more than 150 posts are to be treated, additional creosote will be required, and can be purchased in 50-gallon drums. After the first 100-gallon drum is obtained, it may be figured that each additional 50-gallon drum will treat 150 posts. (About 50 gallons remain in tank at end of treatment)

Operation

Fill the drum with posts (capacity 20 to 25, 4-inch posts).

Fill the drum with creosote to the 3 foot level (45 gallons required).

Build a fire under the treating tank, and heat the creosote to 190° to 200° F.

Maintain this temperature for 5 to 8 hours.

Draw the fire. Be sure the coals are dead.

Completely fill the tank with creosote. Caution: pour cold creosote in gradually to prevent frothing over.

Leave for 10 to 12 hours.

Splash the creosote over the upper sections of posts or dip the upper end in the creosote.

The absorption of creosote ranges from 1/4 to 1/3 gallon a post. A good grade of commercial creosote costs from 25 to 30 cents per gallon delivered at the farm. The cost of material for creosoting a post will range from a minimum of 6 cents to a maximum of 10 cents. Labor and fuel are the only other costs of treating.

In 1929 a farmer in Orange County set up such a home creosoting plant, and successfully treated two hundred round red-maple posts, which he had cut the season before in his woodlot. The actual cost per post was as follows:

Cutting, peeling, pointing	$0.075
Hauling and stacking for drying	0.02
Creosote absorbed per post (1/3 gallon)	0.10
Labor for posts	0.03
Total	$0.225

At a cost of less than 25 cents a post, a supply is obtained which should last twenty-five years in contact with the soil. (From Cornell Extension Bulletin 270, "Growing Wood as a Crop on New York Farms")

Information on treating posts by the tire-tube method and by the steeping process will be found in the references listed.

FENCE POST TABLE

Species	Average Years of Service[1]	
	Untreated	Treated[2]
Ash	6	25
Aspen	4	28
Black locust	30	37*
Catalpa	20	-*
Cottonwood	4	27
Desert willow	20	-*
Douglas fir	7	-
Honey locust	12	27
Junipers[3] (various native species)	40	-*
Lodgepole pine	4	30
Mulberry	20	-*
Mesquite	20	-*
Osage orange	30	-*
Ponderosa pine	5	30
Rocky Mt. white oak[4]	15	-
Willow	3	27

* Not considered economical or necessary to treat.

1. Based on the best data available for average sized posts 7' long, top diameter 3-4 inches.
2. Treated with creosote - hot and cold tank method.
3. Figuring 4-5 inches of heartwood at the ground line.
4. Set green with the bark on.

It is difficult to prepare a table showing the average length of life of fence post woods. So many factors affecting durability are locally important.

Obviously, adjustments in "years of service" must be made for varying conditions of soil, climate, post size and condition, etc. in different localities. Wise use of the data in this table making such corrections for application as you feel you can substantiate should give information of reasonable reliability.

Please send to the Forestry Division, Regional Office, any data you can obtain on these or additional species as mulberry, Russian olive, or others which may locally be important.

References

F.B. 744 - Preservative Treatment of Farm Timbers

F.B. 1117 - Forestry and Farm Income

F.B. 1123 - Growing and Planting Hardwood Seed on the Farm

F.B. 1177 - Care and Improvement of the Farm Woods

F.B. 1210 - Measuring and Marketing Farm Timber

F.B. 1453 - Growing and Planting Coniferous Trees on the Farm

USDA Dept. Circular #64, How Lumber is Graded

USDA Bulletin 863 - Forestry Lessons on Home Woodlands

CCC Forestry Pub. #6, Timber Stand Improvement in the Southwest

Vocational Bulletin #196, U. S. Dept. of the Interior - Farm Forestry

The Forest Manager - American Forestry Association

F.B. 1312 - Tree Planting in the Great Plains Region

F.B. 1405 - The Windbreak as a Farm Asset

Forest Products Lab. R1158 - Tire Tube Method of Fence Post Treatment

" " " R621 - Preservation of Timber by the Steeping Process

Regional Bulletin No. 63, Forestry Series No. 9 - Policy and Practices Governing Cutting of Forest Products

Regional Bulletin No. 53, Woodland Series No. 7 - Tree and Shrub Species Information

Regional Bulletin No. 26, Woodland Series No. 6 - Procedure and Techniques for Tree and Shrub Planting

"A Simple Method of Securing the Technical Data Necessary for the Preparation of Woodland Management Plans" by Geo. F. Rupp, September 1938

Research Report No. 2 - Service Life of Untreated Juniper and Cypress Fence Posts in Arizona by George S. Meagher, Southwestern Forest & Range Exp. Sta., August 1940